NORTHERN CALIFORNIA BOTANISTS

BOTANICAL LEAFLETS

ISSUE 35 FALL 2025

PRESIDENT'S MESSAGE

I'm delighted to take on the role of President of the Northern California Botanists: the community of botanists is very important to me, and I value the programs that the organization manages. I went to my first Northern California Botanists symposium the winter after my first field season as a botanist, and have made it to every symposium since. I feel like my career is intertwined with this organization! I'm always inspired by the projects and discoveries of you, my colleagues, and treasure the opportunity to catch up with all my friends.

The other Northern California Botanists programs are no less valuable. The Barbara Castro Student Botany Research Scholarship – named in honor Barbara Castro, who managed the scholarship program for fifteen years – has funded research into Northern California botany for hundreds of students. The Dean Taylor Botanical Exploration Memorial Award funds botanists seeking to document unexplored botanical diversity. We also publish this newsletter, distribute information on workshops and events via a listserv, and maintain a board of botany jobs on our website.

I'd also like to welcome our new student board members, Vanessa Stevens and Linnea Rydell. We're delighted to have their experience and insight contributing to the Board. Both of them are covered in this newsletter's "Botanists in Action" column! I'd also like to thank our previous student board member, Rebecca Nelson, who has graduated and joined the NCB board as a Director-at-Large.

I have big shoes to fill. Linnea Hanson is a founding member of NCB and acted as president for two decades. I'm very grateful she's staying on the Board to provide advice and input in the coming years. I hope we can set Northern California Botanists up for another great 20 years!

Jane Van Susteren
President
Northern California Botanists

MYSTERY PLANT

This tiny native annual was spotted in a vernal pool on the Modoc Plateau and at first glance it looked like an out of place *Downingia pusilla*...

Answer on Page 6

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NORTHERN CALIFORNIA BOTANISTS IN ACTION

Sarah Gordon

Sarah Gordon fell in love with botany as a graduate student at Sonoma State University (SSU). During those years Sarah could often be found in the herbarium with a dissection scope, the Jepson Manual and numerous plant specimens… when perhaps she should have been analyzing genetic data and running statistical tests. Sarah joined the CNPS Milo Baker Chapter Board as the SSU Student Representative and has been Director at Large, Board Co-President and now serves as Vine Hill Preserve steward, looking after the last remaining wild populations of three rare plants on a small one-acre preserve. The Milo Baker Chapter has been instrumental in unfolding opportunities to participate in local plant activities, from collaborating with and learning from other botanists to weekend rare plant treasure hunts to meeting her husband Jon.

Sarah's first introduction to vernal pools was over twenty years ago as a participant on a Laguna de Santa Rosa Foundation field trip, where she promptly trod upon endangered Sebastopol meadowfoam. She has tried to make amends for this early accident, dedicating her career to vernal pool conservation, first researching genetics and pollination ecology of the Orcutt grass tribe at SSU, to vernal pool surveys and ecological work on the Santa Rosa Plain as an independent botanist. In 2017 Sarah came full circle back to the Laguna Foundation, an environmental non-profit in Sonoma County. As Conservation Science Director, Sarah works with a dedicated team on local rare plant conservation solutions. Together their team has enhanced and cared for acres of degraded vernal pool (and other endangered plant) habitat and grown and outplanted tens of millions of endangered vernal pool plant seeds. Sarah is incredibly grateful to give back to the land and community that she calls home.

Saskia Raether

Saskia Raether is a Museum Scientist at the University & Jepson Herbaria. Currently she assists with the curation of the seaweed and vascular plant collections, supervises work-study students for our many digitizing grants, and helps run our volunteer program. Prior to arriving at the herbarium in 2023, Saskia worked for the USGS completing floristic studies of restored prairies in northern Minnesota and later for the USFS on the Forest Inventory and Analysis program in northern California. Saskia received her M.S. from Humboldt State University studying the seaweed communities in Humboldt Bay and how they change along environmental gradients. In tandem with her studies, she participated in a long-term monitoring project tracking eelgrass populations in Humboldt Bay. She also taught classes in phycology, general botany, and plant taxonomy at Cal Poly Humboldt. Saskia is honored to work for the Herbaria, where she has access to our incredible collections and researchers and can apply her knowledge of plant and algal floristics and taxonomy to curate the collections. Outside of work, Saskia enjoys trail running, hiking, and soccer, botanical illustration and photography, and making educational botany videos.

Linnea Rydell

Linnea Rydell fell in love with plants exploring the coast of Northern California and the woodlands of Sweden. She s a fourth year Plant Science undergraduate at UC Santa Cruz and one of the newly appointed NCB student board members! As part of the Kay Plant Evolution Lab, she is completing a senior thesis which will be further developed into a Master's thesis for a 4+1 Ecology and Evolutionary Biology Master's program. When designing her project, Linnea's goals were to focus on a California native species with research implications that could be applied to conservation and climate change. These qualifications were found in *Leptosiphon parviflorus*, a California endemic species that has a unique tolerance for serpentine soils and drought. More specifically, she was interested in how this species established flower color polymorphisms in different environmental conditions. Previous research has identified a clear pattern of pink *L. parviflorus* flowers being more prevalent on serpentine soils, in drought-prone habitats, and with combined stressors. Her research asks how the presence of

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Message from the Outgoing President

2026 will be the 20th anniversary of Northern California Botanists. After 20 years I have decided to step down as president. Jane Van Susteren is the new president and Nicole Jurjavcic is the new vice president. I plan to stay on the board to help as needed.

In the early 1980s, I shared an office on the La Porte Ranger District of the Plumas National Forest with a wildlife biologist and a fisheries biologist. In the winter, they each went to their respective meetings, the Wildlife Society and American Fisheries Society meetings. As a botanist, I didn't have any such meeting to go to. I did help with the first Rare Plant Conference that the California Native Plant Society had in the mid 1980s but besides another Rare Plant Conference on the north coast in 2002

there hadn't been a forum for professional botanists in Northern California to share and present knowledge. Since the early 1990s I tried to start a professional botanist conference through the California Native Plant Society and then the California Botanical Society but that didn't work. John Willoughby, who was the State Botanist for the Bureau of Land Management in the early 2000s, suggested I start a professional botanists organization in Northern California similar to Southern California Botanists. So, that's what I did! It has been a wonderful experience and has been quite a ride.

Take care and remember to take time to enjoy the flowers! Botany Rocks!

Linnea Hanson

Northern California Botanists in Action – continued

anthocyanin, a flavonoid that creates the pink pigment found in some plants, plays a role in the climatic stress tolerance of *L. parviflorus*. Linnea is excited to join NCB as a Student Board Member, and looks forward to collaborating with other naturalists to increase knowledge about botanical issues and exploration.

Vanessa Stevens

Vanessa Stevens was raised in Richmond, California, where her interest in cultural and environmental studies was cultivated in extensive outdoor play, wonder and freedom. Her early academic studies are rooted in Arts & Humanities, Geography, with degrees from Lake Tahoe Community College and San Francisco State University, respectively. Vanessa's career in Conservation Planning and Analysis provides concentration in Restoration, Field Techniques, Conservation Biology, with an emphasis in Botany, has provided her with a strong foundation and experience as a seasoned professional, contributing emphasis in the fields of Ecology and Information Management, leading to graduate school at CSU Chico in Interdisciplinary Studies – Wildland Management. Vanessa holds certifications as Geographic Information Systems with an emphasis in Environmental Analysis, Technical Assistance Provider in Regenerative Agriculture & Resilient Systems from CSU Chico, growing qualifications as a Good Fire practitioner as well as applied experience in Wetland Assessment Restoration, Rangelands and Fire Ecology on project, watershed and regional scales. Accomplished in stewardship coordination, she has been fortunate to facilitate many successful collaborations interdepartmentally and with non-profit agencies in support of community-based land stewardship across the San Francisco Bay Area, Northern California, Sierra Nevada, and international endeavors in Portugal, Spain, Hawaii, Madagascar, Guinea and England. At present she supports the Tahoe NF Hydrologist in timber and fuels preparation, wetland assessments and watershed restoration action plans on the Truckee and Sierraville Districts.

Vanessa's service in the Conservation Corps planted the seed of volunteerism – which is a core value in her life. She says that she is grateful and honored to be selected as the Student Board Member of the Northern California Botanists and looks forward to learning through this treasured organization and community.

2025 Dean W. Taylor Botanical Exploration Award

In 2020, we lost Dean William Taylor, a giant of the Northern California botanical community. He had an irrepressible enthusiasm for everything botanical, a genius for teaching, and an unparalleled understanding of the mechanisms driving plant speciation and distribution. His record of outstanding collections and discovery of new taxa speaks for itself. Dean was a champion of the unexplored botanical diversity of California and frequently took the stage at our symposia to encourage people to collect specimens and work to define that diversity. In the absence of his electrifying speeches and reliable advice, we hope that our material support of this Award will help a new generation of botanists fill his shoes.

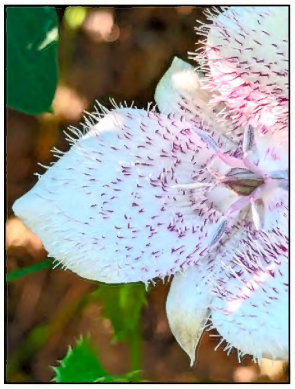
The aim of the Dean W. Taylor Botanical Exploration Memorial Award is to cover costs associated with botanical exploration in Northern California. This award is **open to all people** with an interest in the native plants and wildland ecology of Northern California, including students, practicing botanists, land managers, and dedicated herbarium collectors. We encourage projects that echo Dean Taylor's goals of finding unknown botanical diversity in California, namely collecting in under-collected areas, work to explore the habitat and range of known taxa, and efforts to discover and define new taxa.

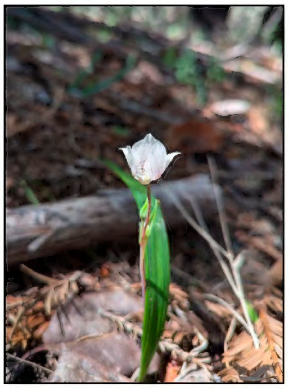
The application period for the 2026 field season is now closed. Watch for announcements for the 2027 field season coming sometime next summer.

Here are progress updates from the 2025 Award winners about their field seasons.

Natalie Braun, University of California, Merced
Botanical Survey of the Fort Sage OHV Area, Lassen County.

This season's floristic survey at the Fort Sage OHV area was shaped by uncooperative weather. My first planned visit in May was postponed due to snowfall, and by the time I returned in June, temperatures were already in the 90s. In those four weeks, Fort Sage's vegetation moved rapidly through its bloom period, and I missed peak flowering. By then, the only plants still blooming were a handful of woody Aster species. I hope to return next spring, because in this line of work, the plants love to remind us who's actually in charge of the calendar.





Elsa de Becker, University of Illinois at Urbana-Champaign
Calochortus tolmiei in San Mateo, Santa Cruz, and Santa Clara counties.

In California, *Calochortus tolmiei* is found from Monterey Bay to the Oregon border; plants south of the Golden Gate have a distinct flower appearance and appear to have different phenology from those north of the Golden Gate. I visited populations in Santa Cruz, Santa Clara, San Mateo, Marin, and Sonoma counties, in habitat ranging from post-fire redwood regrowth to coastal prairie, to take measurements of flowers and record bloom stage in an effort to document how different the species is in the extreme south of its range. I plan to visit sites again next season to collect additional phenology data.

Hannah Kang, Brigham Young University
Cryptic Species Discovery in the *Navarretia leucocephala* Complex.

I had a fantastic field season, collecting 43 populations across Northern California that span the entire *Navarretia leucocephala* complex. I am deeply grateful to Northern California Botanists for the Dean Wm. Taylor Award, which was instrumental in funding this research for my Ph.D. Thanks to this support, I now have a strong baseline and will continue sampling additional populations next year to build on this work.

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2025 Dean W. Taylor Botanical Exploration Award – continued

Sarah De Groot, Kansas State University
Botanical Exploration and Documentation in the Southern Last Chance Range, Death Valley National Park.

Although Spring 2025 was dry, my colleagues and I were able to do some scouting in the Last Chance Range this fall. On Oct. 13 we had lovely weather for a hike northeast of Dry Mountain, scouting a route for a more extended trip to that area. I found a lone shrub of *Philadelphus microphyllus*, which had not previously been documented in the area. On Oct. 14, it rained all day, so we looked at sites nearer to roads. It was really interesting to see the Last Chance Range in fog, with puddles! So often it is hot, dry, and windy. More rain has fallen since then, and I am very eager to go back next spring.

Hugh Safford, Department of Environmental Science and Policy, University of California, Davis
Field surveys for high elevation Jeffrey pine and other trees in the southern Sierra Nevada.

This summer we organized four one-week field sampling excursions in the High Sierra: in Yosemite National Park, Sequoia-Kings Canyon National Parks, and on the Inyo National Forest. Altogether we walked more than 240 miles, climbed more than 70,000 feet, and summitted more than 20 peaks, most of them higher than 13,000 ft in elevation and three over 14,000 ft. We greatly expanded the footprint of the Jeffrey pine "invasion", and found the highest individuals of every single subalpine tree species in the southern Sierra Nevada, increasing the known elevational range of different species from between 800 to 1400 feet. We discovered the first trees – they were whitebark and lodgepole pines – ever found above 4000 meters (13,124 ft) in California. We also began to develop hypotheses related to Jeffrey pine's presence at high elevations and the important role that the Clark's nutcracker plays in dispersing the seeds. We are currently building a database of high-elevation trees in the California and looking for more substantial funding to support another field season.

The study captured the fancy of many people, and the UC-Davis press office released a podcast and a story based on our work. We have also given many media interviews, the most recent of which was a live segment on Capitol Public Radio's Insight program on Monday morning, December 1.

Thanks so much for your support!

2025-2026 Barbara Castro Student Botany Research Scholarships

Northern California Botanists (NCB) provides competitive scholarships to undergraduate and graduate students doing botany and plant ecology research in northern and central California. Research scholarships are funded by NCB with the goals of encouraging students to pursue academic endeavors toward a career in botany, promoting undergraduate and graduate botany and plant ecology research, and implementing objectives of the NCB mission. The Sacramento Valley and Shasta Chapters of CNPS generously support this program by providing funding toward additional scholarships.

Students from any accredited college or university doing research within the NCB geographic range may apply for the NCB Barbara Castro Student Botany Research Scholarships. Applications for 2026-2027 are now being accepted. The application period ends March 15, 2026.

The recipients of the Awards for 2025 -2026 were listed in the previous Newsletter. Here is more detailed information about their projects.

Allison Titus, California State University, Sacramento
Inundation depth affects vegetation diversity in California's Central Valley vernal pools

Understanding the relative importance of environmental factors affecting biodiversity is a key concept in ecology. According to community assembly theory, abundance and diversity of organisms is determined by hierarchical "filters" that either allow or inhibit certain species to occur within an ecosystem. Environmental filters can be biotic (e.g., competition, predation) or abiotic (e.g., precipitation, temperature, resources). Ecosystems with strong abiotic constraints, such as vernal pools, are excellent study systems for researching the relative importance of specific environmental filters on community diversity and composition. In California's vernal pools, temporary inundation from annual precipitation is an important environmental filter that affects plant and animal community composition. Pool inundation in rainy winter months limits invasive vegetation species from encroaching on this habitat and likely contributes to the high rates of plant species endemism in vernal pools. However, the relative importance of inundation depth to native vegetation diversity versus other hydroperiod characteristics, such as inundation timing, has not been well isolated. My research examines the relationship between inundation depth and native plant diversity, as well as other functional vegetation groups, using two approaches: data mining of existing vernal pool vegetation data and a field study at a vernal pool complex in Sacramento County. Understanding these trends may contribute to conservation of these vulnerable, endangered ecosystems in the face of climate change and development.

This study will take place in 36 vernal pools of various basin depths located within Mather Regional Park, a 1,342-acre conservation area in Sacramento County, California. Data collection will begin when vernal pools inundate in fall 2025 and conclude after vegetation data is collected during peak flowering season in spring 2026. The relationship between vegetation diversity and pool depth, as well as other dependent vegetation variables such as abundance, will be analyzed using linear regression and/or linear mixed models. I predict that abundance-weighted native species richness will be highest at intermediate depths, demonstrating a unimodal curve. Furthermore, I predict that shallow pools will have lower native species diversity and higher non-native and grassland species because there is less inundation constraint. Finally, I predict that deeper pools will have lower plant diversity due to the prolonged inundation period and they will have a higher abundance of wetland vegetation species adapted to long inundation periods.

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Answer to "Mystery Plant":
… Upon closer inspection the plant had linear basal linear leaves and single flower on a short scapose stem. The flower is radial with a bell-shaped tube and five lobes. The four stamens are all attached to the corolla tube at the same level. The ovary is superior and the fruit is a capsule. Answer: ***Limosella acaulis*** Photo by Russ Huddleston June 13, 2025

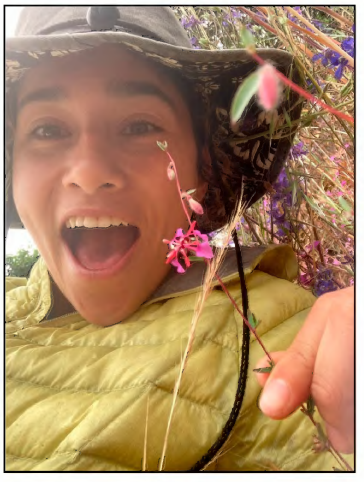
2025-2026 Student Botany Research Scholarships (cont.)

Charles Boissavy, Claremont Graduate University
Phylogenetics, taxonomy, and biogeography of the Latifolia Clade in *Eriogonum*.

Eriogonum or wild buckwheat, in the family Polygonaceae, constitutes the fourth-largest North American flowering plant genus north of Mexico and second-largest in the floristic hotspot of California. Within *Eriogonum*, an understudied but widespread lineage is the Latifolia clade. Previous phylogenetic study revealed this lineage to comprise of five species, but morphological analyses suggest six other candidate species. My project aims to elucidate membership and relationships within the Latifolia clade using a much larger DNA sequence data set than in previous studies. One species of particular interest is *E. nudum* which comprises 15 varieties distributed from southern Washington to northern Baja California with the center of taxonomic diversity in California. The species varies appreciably in flower color and occupies a wide range of habitats and substrates throughout its range. I sampled Latifolia clade taxa from multiple populations across their range at the species and varietal levels. For each sampled individual, I gathered molecular data using the ddRADseq method. Samples from six species, including 13 varieties, from throughout California and Oregon, were successfully sequenced. I used IQ-TREE to estimate a phylogeny of the Latifolia clade under the maximum likelihood criterion. These preliminary results indicate that all of the six species sequenced are members of the Latifolia clade with *E. latifolium* and *E. nudum* being non-monophyletic. The phylogeny also provides a solid framework to investigate distribution patterns and flower color diversification. Future work entails collecting and sequencing more taxa as well as sampling soils where *E. nudum* grows to examine edaphic diversification.

Cecilia Girvan, University of California, Santa Cruz
Conflicting selection via sexual function in *Clarkia unguiculata*.

Floral maintenance uses resources that are shared among a variety of plant functions, and increased floral longevity may come at a cost to reproductive functions (Ashman & Schoen, 1997). *Clarkia unguiculata* flower in late summer when water is scarce. The transpirational water costs of keeping a flower open may reduce seed set. A trade-off between resource allocation to floral maintenance instead of seed production could therefore result in negative selection pressure on floral longevity via female function. I am testing the hypothesis that longer floral longevity comes at a cost to female fitness. Additionally, I predict that this effect will be greater in drought-stressed plants. I am conducting a greenhouse experiment using pollination-induced flower senescence to test whether longer floral longevity negatively affects seed set and whether this is strengthened by drought. Ultimately, these results will be used in conjunction with my separate experiment on the relationship between floral longevity and male fitness to parse the relative strengths and directions of selection on floral traits via sex function.



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2025-2026 Student Botany Research Scholarships (cont.)

Lynn Breithaupt, University of California, Merced
Potential phenological mismatches in seasonal wetlands: Testing the effects of plant-pollinator timing shifts on plant fitness.

Climate change impacts life on a global scale and across various systems, but it is particularly concerning in regions that are exceptionally rich in biological diversity and uniqueness. California's vernal pools, dominated by endemic native plants, have lost over 90% of their historical extent due to habitat loss, pollution, and climate change, making their conservation increasingly urgent. An additional growing concern for these ecosystems, and many others, is **phenological mismatch**. This risk, heightened by global pollinator declines, a decoupling of flowering time and pollinator activity that can limit reproduction and destabilize communities. Since 85% of flowering plants depend on animal pollinators for reproduction, understanding how plant–pollinator interactions function in endangered ecosystems is essential for protecting biodiversity and ecosystem resilience. While vernal pool pollinators have been studied in Northern California, little is known about their dynamics in the Central Valley.

To address this gap, I am investigating plant-pollinator interactions at the Merced Vernal Pool and Grassland Reserve through two complementary approaches. First, I survey the phenology, diversity, and abundance of plant and pollinator communities across space and time to detect potential mismatches, and to understand the community dynamics of the habitat. Second, I will experimentally test the reproductive outcomes of *Limnanthes douglasii* ssp. *rosea* (meadowfoam) under three pollinator treatments within multiple pools: exclusion (pollen limitation), natural pollination (open pollination from wild bees), and hand-pollination (optimal pollination) treatments, evaluating how synchrony or mismatch can influence seed set and viability. This work will clarify how climate-driven phenological shifts affect mutualistic interactions in vernal pools and provide critical insights for conserving these imperiled ecosystems.

Samantha Ingram, Claremont Graduate University
Unraveling the taxonomic and phylogenetic complexity of *Ericameria parryi* in the Western United States.

The *Ericameria parryi* complex (Asteraceae) represents a taxonomically challenging group of shrubs distributed across semi-arid and montane habitats across the western United States, including several endemic varieties in Northern California. Despite the ecological importance across *Ericameria* species (providing pollinator resources, stabilizing soils, and contributing to post-fire regeneration) varietal boundaries within this complex remain unresolved. This project combines herbarium research, fieldwork, and molecular phylogenomics to investigate morphological and genetic diversity across the 12 recognized varieties of *E. parryi*. This study will result in a robust phylogenetic framework to test the validity of current taxonomic treatments, and provide data to help evaluate conservation status and rarity across intraspecific taxa. Broader impacts include conservation recommendations, undergraduate research training, and community education workshops. Overall, this research will advance understanding of diversification in *Ericameria* and contribute to conservation strategies for California's unique flora.

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2025-2026 Student Botany Research Scholarships (cont.)

Chenjiao Deng, University of California, Davis * Shasta Chapter Awardee*
Phylogenomic and species delimitation studies of the genus *Sidalcea* (Malvaceae).

This proposed project aims to produce a robust and comprehensive phylogeny of the genus *Sidalcea* (Malvaceae) and clarify the identities of morphologically ambiguous taxa using genome-scale approaches. Despite the ecological and conservation importance of *Sidalcea*, aspects of its classification remain unresolved, with taxonomic boundaries in several species complexes difficult to distinguish based on morphology alone. To address these challenges, I will employ target capture sequencing with the Angiosperm353 probe set to reconstruct phylogenetic relationships across the entire genus. At a finer scale, I will apply genotyping-by-sequencing (GBS) to delimit species and subspecies boundaries among five problematic taxa that overlap geographically: *S. asprella*, *S. celata*, *S. elegans*, *S. gigantea*, and S. *glaucescens*. This approach will allow the integration of a broad phylogenetic context with detailed population-level analyses, producing a robust framework for interpreting species limits. Resolving these taxonomic ambiguities is essential for conservation management, particularly for rare and threatened species in the genus. In addition, this research will contribute to the development of an improved and more practical field guide for *Sidalcea* identification, providing botanists with a reliable tool for accurate species recognition during future ecological surveys.

Georgia Vasey, University of California, Santa Cruz
Restoring native annual forbs in prairies with fire and microsite management.

California coastal prairies are a diverse grassland habitat bound by the maritime fog, with over 300 native plant species. After centuries of fire suppression, the introduction of non-native weeds, and conversion to development or agriculture, most prairies remain degraded. Practitioners have spent decades restoring these prairies, but a recent study found that 90% of the projects outplant the same seven perennial species. While this strategy may help meet cover targets, it risks homogenizing plant communities. Annual forbs make up 40% of the threatened and endangered plant species statewide, yet contribute 25-60% of the native diversity within coastal prairies. My project investigates how to restore native annual forbs in coastal prairies by testing which combination of interventions (prescribed fire, microtopographic construction, and herbicide) with seed addition is most effective for reestablishment. I set up 26 blocks across four paired prairies (burn/unburned) at Wilder Ranch State Park in 2023 and 2024. Each block contains six plots assigned with treatments in a factorial design, crossing topographic heterogeneity (no manipulation, mound, swale) with herbicide application (none, herbicide). Each plot was seeded with 6-9 different species at 325-800 seeds/m^2, divided into 0.5 x 0.5-m quadrats. In the spring following seeding, I recorded weekly counts of germinating individuals, number of flowers, and seed phenology. Monitoring will continue through 2026 to track recruitment into years two and three. This experiment will provide land managers with practical strategies to restore annual forbs and increase prairie biodiversity and resilience.

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2025-2026 Student Botany Research Scholarships (cont.)

Sebastain Evans, Cal Poly Humboldt
Trajectories of succession and alpine-plant habitat of a recently deglaciated foreland basin in the Trinity Alps, California.

In the Trinity Alps, the recent extinction of the Salmon Glacier presents a unique opportunity to study post-glacial succession. The Trinity Alps are in a region of high endemism and biodiversity that is already showing signs of biological stress under current climatic trends. Understanding how species compositions and interactions change through time is crucial to conserve alpine-specialist plants and the biodiversity they support, especially in post-glacial habitats. Using a chronosequence approach, I propose to answer the following questions: *i) What is the successional trajectory of vegetation in the Salmon Glacier foreland? ii) Does the Salmon Glacier foreland show early signs of acting as a climate refugium? iii) How does facilitation between bryophytes and vascular plants change over time?*

Logan Holey, Cal Poly Humboldt
Variation in plant traits across microhabitats under solar microgrids in Coastal Grasslands

The rising demand for clean energy is driving the expansion of photovoltaic systems. In rural areas, solar microgrids offer reliable access to renewable power, and their versatility makes them suitable for coastal grasslands with variable topography and land use. These microgrids can also create distinct microhabitats by altering shading, rainfall, and temperature patterns. Plant functional traits help reveal which species establish in these conditions because traits reflect environmental constraints. For example, increased plant height often signals competition for light, so I expect shading from microgrid panels to select for species that grow taller to access sunlight.

We sampled three solar microgrids in coastal grasslands in Humboldt County for plant community composition and leaf traits. Microhabitats sampled were 1) the open area between two panels (F); beneath the panel at 2) the top edge (T); 3) directly under the center of the panel (C); and 4) the bottom edge (B). We assessed plant traits of dominant species for: leaf dry matter content, specific leaf area, plant height, and leaf lobedness. We are currently measuring photosynthetically active radiation to assess light availability across microhabitats.

Using a mixed-effects linear model, we found plant height was higher at the T and B positions relative to the F position. I found that leaf lobedness was higher at the T position relative to the M and B positions.

Higher community weighted leaf lobedness at the T position may be caused by climatic variables like increased ambient temperature and soil moisture. Shading may explain increased community weighted plant height at the T and B positions. Understanding how dominant species express plant functional traits in different microhabitats can help explain how plant communities assemble under microgrids to inform plant selection for habitat enhancement or restoration.

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2025-2026 Student Botany Research Scholarships (cont.)

Garrett Goodrich, Claremont Graduate University
Big Meadows and Giant Sequoias: A Vascular Flora in the Vicinity of Boulder Creek, Fresno and Tulare Counties, California

The Sierra Nevada in California features globally significant levels of plant diversity; however, floristic sampling within the mountain range has been extremely uneven, and under-sampled areas remain. Floristic inventories in these sampling gaps frequently reveal new rare taxa and range extensions of known taxa. During the 2024 and 2025 field seasons, a floristic inventory of one understudied portion of the range in the vicinity of Big Meadows, Boulder Creek, and the Jennie Lakes Wilderness (Fresno and Tulare counties) is being conducted to search for novel taxa, document range extensions, and provide a comprehensive understanding of the local plant communities. Sampling for this research covers more than 200 km^2 of land and focuses especially on areas with known occurrences of rare species, no historical collections, and unique features associated with endemism. Approximately 1,100 specimens will be collected, identified, and deposited in herbaria to support the resulting voucher-based annotated species checklist and inventory. To date, over 1,000 specimens have been collected, including at least 17 minimum-rank taxa with California rare plant ranks. High-intensity fire, invasive species, recreation, logging, grazing, and climate change all represent significant threats to the plants of this study area; thus, conducting a thorough botanical inventory is essential to conserving plant biodiversity in this understudied portion of California.

Zach Kinman, Cal Poly Humboldt
Evolution of the Humboldt mule's ears (*Wyethia longicaulis*): Testing for budding speciation.

The California Floristic Province (CFP) is the most botanically diverse region in North America, home to over 6,000 native plant species, nearly half of which are endemic. This remarkable diversity makes the CFP an ideal place to explore evolution. While most of the research focuses on macroevolutionary patterns, evolution actually begins on a small scale within populations. Bridging the gap between larger and finer scale processes helps us understand how plant species emerge. In the CFP, a likely common process for the emergence of new species is "budding speciation," where a small, distinct population splits off from a widespread ancestor while remaining within the same geographic range. I am investigating whether the harsh conditions of serpentine soils (low nutrients, heavy metals, and limited water) have driven the divergence of *Wyethia longicaulis* from its progenitor species. To test this, I will sample seven *Wyethia* species, focusing on likely progenitors, examining both their phylogenetic placement and ecological niche to determine if budding speciation has occurred. Understanding what drives plant speciation can reveal why some species are rare or unique to California. This research also highlights *W. longicaulis* as a species that may deserve focused conservation efforts.

continued on next page

2025-2026 Student Botany Research Scholarships (cont.)

Wesley Radford, SUNY College of Environmental Science and Forestry
Integrated approaches to climate resilient forest restoration of sugar pine (*Pinus lambertiana*)

Over the last decade, climate-exacerbated weather patterns have devastated California's wildlands through catastrophic wildfires, widespread and unprecedented pest outbreaks, and severe and prolonged drought. The Lake Tahoe Basin (LTB) of California has experienced these selective environmental pressures, which have severely impacted the sugar pine (*Pinus lambertiana* Doug.) throughout the region. Integrating methods for micro-planting site selection using advanced technologies such as remote sensing and machine learning models, combined with soil microbial assessments can decrease planted tree mortality and aid restoration efforts. Remote sensing data was collected from empirical sources to develop a site quality index for accurate micro-planting site selection. Soil samples were taken from 200 sugar pine planting plots to estimate the effect of legacy microbial communities on seedling growth and survival. Sequencing soil samples will reveal microorganisms both beneficial and detrimental to sugar pine development. Relating microbial communities and tree response to tangible environmental characteristics, such as herbaceous or shrub species density, canopy cover, and soil moisture will establish baseline identifiers for optimal micro-planting sites. Modelling relationships through machine learning will promote identification of beneficial microbiomes to further enhance sugar pine success around Lake Tahoe and provide proof of concept for enhancing forest restoration efforts in a changing world.

Linnea Rydell, University of California, Santa Cruz
Investigating the Role of Anthocyanin in Climatic Stress Tolerance of *Leptosiphon parviflorus*

Interactions among plant pigments, climate, and soil factors are surprisingly unstudied despite their likely importance in shaping plant traits, distributions, and adaptive responses. In my research, I use the California endemic species *Leptosiphon parviflorus* to investigate the maintenance of an anthocyanin based flower color polymorphism, focusing on adaptation to abiotic conditions. Anthocyanin is a purple flavonoid pigment that influences the color of *L. parviflorus* flowers, causing white to pink phenotypes depending on concentration. Previous research has identified a clear pattern of pink *L. parviflorus* flowers being more prevalent on serpentine soils, in drought-prone habitats, and with combined stressors. This pattern indicates that flower color may have pleiotropic or genetic linkage effects on vegetative physiology and function, and that the presence of anthocyanin will increase fitness in stress environments. To explore this hypothesis, a batch of seeds are grown in a greenhouse, crossed, and then used in a common garden experiment in which water availability and Mg^{2+} levels are manipulated. Each family is then tested for vegetative chemistry, ion uptake, gene expression, performance, and fitness. This research will help us understand the tradeoffs involved with adaptation to these unique conditions, with the goal of contributing to the conservation of California flora.

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